18. (a) State and prove Convolution theorem.

(b) Use Convolution theorem to find the functions whose Laplace transforms are $\frac{1}{(s+a)(s+b)}$.

19. Using group theory discuss Infra red and Raman activity of CH_3Cl molecule.

20. Obtain Poisson distribution; hence derive mean and variance Poisson distribution.

Shanmuga Industries Arts & Science College T.V.Malai

APRIL/MAY 2025

GPH21/DPH21 — MATHEMATICAL PHYSICS – II

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. State Cauchy Residue theorem.

2. Define analytic function.

3. If $V = x^2 + 3xy$, find $\frac{\partial v}{\partial x}$.

4. Give any two physical problems where Laplace differential equations were used.

5. Find the Fourier sine transform of sin ax.

6. Prove the shifting property of Fourier transform.

7. What is a cyclic group? Give examples.

8. Define Abelian group.

9. What is priori posterior probability?

10. Define moment generating function of binomial distribution.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) State and prove Cauchy's integral formula.

Or

(b) Construct the analytic function $f(z)=4+iv$ where $u=-r^3\sin 3\theta$.

12. (a) Obtain the solution for the differential equation $\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}=0$ and obtain $\phi(x,y)$, given $\phi(x,0)=\phi(0,y)=0$.

Or

(b) Obtain the equation of motion for the vibrating string.

13. (a) Find the Fourier transform of the function $f(x)=Ne^{-\alpha x^2}$ where N and α are constants.

Or

(b) Find the Laplace transform of $t^n f(t)$.

14. (a) Compare and contrast isomorphism and homomorphism.

Or

(b) Construct the character table for C_{2v}.

15. (a) State and prove Laplace-de-Moivre theorem.

Or

(b) Derive the first four modes of binomial distribution.

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SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Expand $f(z)=\sin z$ in Taylor series

(a) $z=0$ and

(b) $z=\frac{\pi}{4}$.

17. Obtain the solutions of three dimensional heat flow diffusion equation.